

SHORT COMMUNICATION

The host becomes dinner: possible use of *Cyclosa* as a nuptial gift by *Argyrodes* in a colonial web

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Abstract. Nuptial gifts in spiders are poorly documented. We report on an observation and on photographs of a colonial web in San Vicente de Chucurí, Santander, Colombia, which suggest a likely case of nuptial gift behavior in a male of the kleptoparasitic spider *Argyrodes elevatus* Taczanowski 1873 (Araneae: Theridiidae). Pictures of a male *A. elevatus* holding a dead *Cyclosa huila* Levi 1999 (Araneae: Araneidae) wrapped in silk, in close proximity to a female *A. elevatus* facing him, document the couple at various moments at dusk and early the following morning. While no copulation is seen, these pictures suggest an attempt by the male to deliver a nuptial gift. Our observations support a recent report of apparent nuptial gift behavior in *A. elevatus* and raise questions on the foraging behavior of kleptoparasitic spiders in communal webs.

Keywords: *Argyrodes elevatus*, kleptoparasite, nuptial feeding, *Cyclosa huila*, communal web

While nuptial gift offering during courtship and mating is well documented in insects (Vahed 1998), it has rarely been seen in spiders (Costa-Schmidt et al. 2008). Male offerings of nuptial gifts in the form of a prey item wrapped in silk are currently known in only two spider families: Pisauridae (Stahlhandske 2001, 2002; Itakura 1993, 1998) and Trechaleidae (Costa-Schmidt et al. 2008). Recently, Uetz et al. (2010) described in the theridiid *Argyrodes elevatus* Taczanowski 1873 (Araneae: Theridiidae) what may be the first nuptial gift behavior seen in a spider family outside the Lycosoidea clade. Since we still lack examples of nuptial gift behavior in spiders, our ability to understand the evolutionary origin of this behavior and its potential role in sexual selection in spiders remains limited (Costa-Schmidt et al. 2008).

During a visit to the Reserva Reinita Cielo Azul (6°50'47"N, 73°22'30"W), located in the Cordillera Oriental of Colombia, a male *Argyrodes* was observed approaching a female, positioning himself to face her while holding a prey item in his chelicerae, and remaining in close proximity, an unusual activity reminiscent of nuptial gift behavior. Spiders of the genus *Argyrodes* are cosmopolitan kleptoparasites on other spiders, especially web-building species (Agnarsson 2002). Most *Argyrodes* steal silk and food from their host by scavenging prey items from the web, but they sometimes kill and eat the host itself (Wise 1982; Whitehouse et al. 2002; Kerr 2005).

The observations and pictures that we describe here were taken while documenting the spider species composition of a relatively large communal spider web (length 323 cm, height 107 cm and width 132 cm) found on a fence by a dirt road. Photographs were taken with a Panasonic digital camera on 30 Dec 2008 at dusk and on 31 Dec 2008 at dawn, after which all spiders were captured and preserved in ethanol. We later identified the *Argyrodes* pair and the host species as *Argyrodes elevatus* Taczanowski 1873 (2 males, 9 females) and *Cyclosa huila* Levi 1999 (Araneae: Araneidae) (38 females). The date and time at which each picture was taken were recorded by the camera and used to build a sequence of pictures. Based on the relative numbers of species and the communal web structure, a tight concentration of smaller interconnected webs, it seems that *C. huila* created the primary aggregation of orb webs, which was subsequently invaded by other species, including *A. elevatus*.

The prey item displayed by the male *A. elevatus*, lightly wrapped in silk, was larger than he was. When the male was approximately 3 cm

from the female, he came to a stop facing the female, which by then was also oriented toward him. At this time (17:22 h), a picture of the pair was taken (Fig. 1a). The pair remained facing each other at this distance for at least 2 min, as indicated by a picture taken after. A picture taken 42 min later (Fig. 1b) shows the male still holding the prey item in his chelicerae, but the female is located a few cm further from the male than in the previous picture, and both individuals face in opposite directions.

Close-ups of the prey item (Figs. 1a, b) displayed by the male depict an eight-legged arthropod whose pointed abdomen and dorsal pattern are strongly evocative of *C. huila* (Fig. 2). Since the male *A. elevatus* was not seen attacking and killing the host, we cannot determine whether the item was preyed upon by *A. elevatus* or scavenged after its death.

A picture of the web taken the following morning at 06:12 h shows the *A. elevatus* couple no longer interacting, as indicated by the resting position (Fig. 1c). The male remains relatively close to the female (about 4 cm) but faces away from her and no longer carries the prey item seen the night before.

Although these pictures do not document copulation, three features are indicative of an attempt of the male *A. elevatus* to deliver a nuptial gift to the female: 1) the initial approach of the male holding a wrapped prey item in his chelicerae, an unusual behavior since *Argyrodes* typically carry their prey attached to the spinnerets (Vollrath 1979; Cangialosi 1990); 2) the orientation of the couple where the two individuals face each other; and 3) the persistent close proximity of the male to the female.

The mating behavior of *Argyrodes* follows a consistent sequence, where the male orients toward the female and approaches her while producing courting vibrations, before eventually copulating (Whitehouse & Jackson 1994). Except for mating behavior, intraspecific interactions in *Argyrodes* in the host web are normally of short duration (e.g., Whitehouse & Jackson 1994). For instance, in *Argyrodes antipodiana* O. Pickard-Cambridge 1880, male-male grappling interactions range from 3 s to 6 min (Whitehouse 1997), whereas courtship-copulation interactions last between 2 and 8 h (Whitehouse & Jackson 1994). Given that the interaction that we report lasted at least 44 min and that the male held the prey item in his chelicerae during the entire interaction, we believe that this behavior was deliberate and that it represents an unusual courting interaction in which the male used its host *C. huila* as a gift to entice a female.

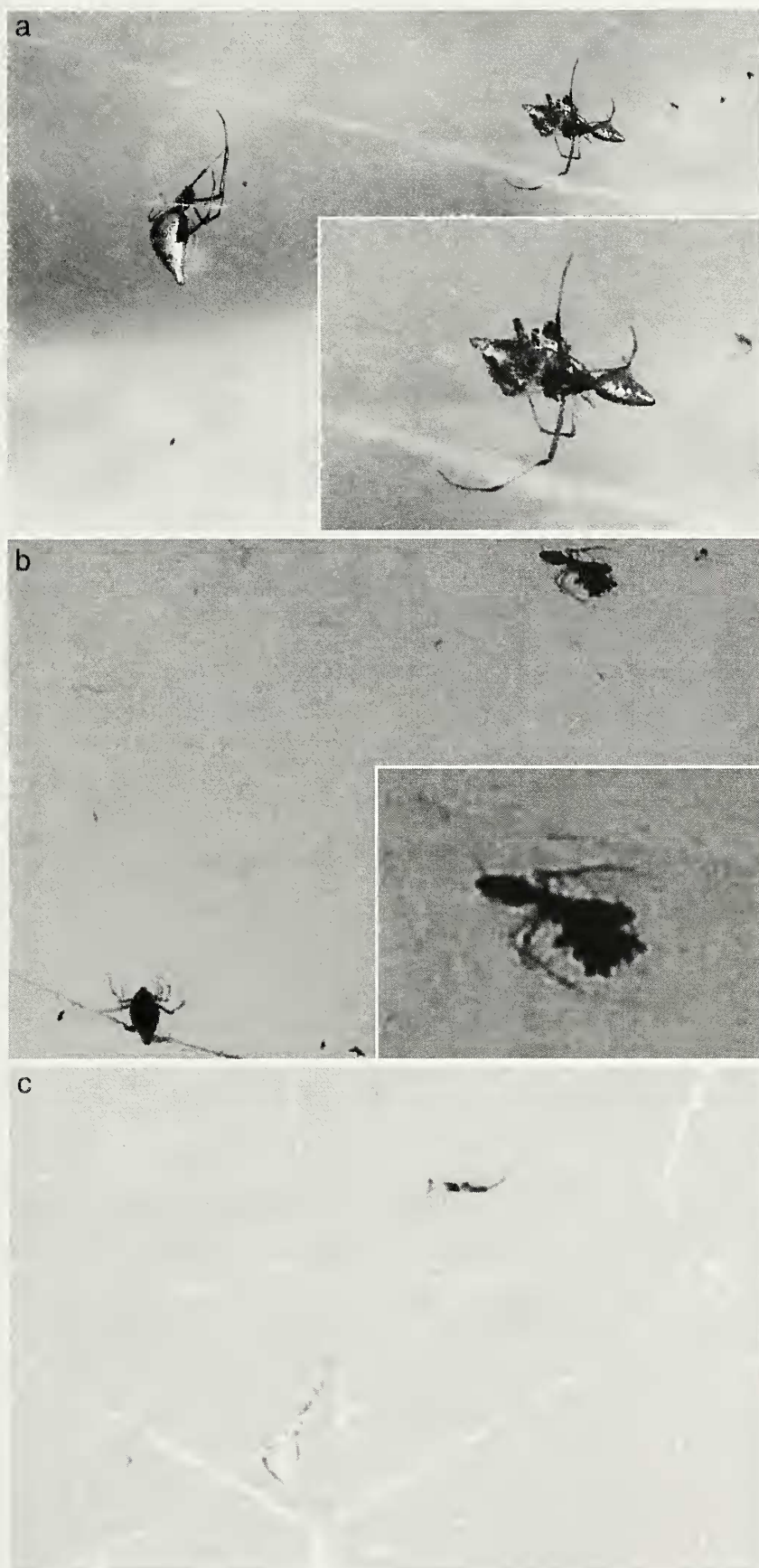


Figure 1.—Sequence of photographs taken in the field illustrating possible male nuptial gift behavior in *A. elevatus*. a. Male with prey item, facing female (picture taken at 17:22 h); b. male and female facing away from each other, male still holding prey item (picture taken at 18:04 h); c. male and female at rest the following morning, male with no prey item (picture taken at 06:12 h).



Figure 2.—Live *Cyclosa huila* from the same communal web as the *A. elevatus* pair.

The evolutionary relationships within *Argyroides* remain poorly understood, but the genus is currently composed of six monophyletic clades, each with a typical feeding behavior (Exline & Levi 1962; Whitehouse et al. 2002). *A. elevatus* belongs to the *Argyroides* clade, which specializes on kleptoparasitism rather than araneophagism (Whitehouse et al. 2002). The apparent use of *C. huila* as prey by *A. elevatus* exposes the variable nature of the relationship between these parasites and their hosts.

Obligatory kleptoparasites depend on resources provided by their host, and they rarely migrate to other webs once a suitable web has been found because suitable webs are rare resource patches (Agnarsson 2003). Since communal hosts provide more resources to *Argyroides* than the webs of solitary hosts (Agnarsson 2003), episodic araneophagy in the *Argyroides* clade may be more likely to occur on communal hosts than on solitary hosts, because eliminating a solitary host would deplete the resource income of *Argyroides* and result in an energetic cost to search for a new host. In contrast, eliminating an individual of a communal host species would not deplete the resource income, because other individuals of the host species would still remain. In our case, the host was *C. huila*, a social species (Levi 1999) of the territorial periodic-social category (Avilés 1997), in which each *C. huila* spun its own orb web, and all individuals were adults. We have no evidence that the *C. huila* was killed by *A. elevatus*, but our observations generate questions for which answers would improve our understanding of the links between the phylogeny of *Argyroides* and the diversity of foraging behaviors in the genus. For instance, we could gain insight into these links by determining if the unusual

behavior reported here is rooted in episodic araneophagy and if so, if the use of the host by *A. elevatus* is related to the social nature of *C. huila*.

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